

**SELECTIVE DISSEMINATION OF INFORMATION
AS OF November 2018**

ACKEE FRUIT

Emanuel, M.A., Tennant, P.F., Brecht, J.K. and Huber, D.J. (2018). Effect of BreatheWay® microporous membrane on gaseous atmosphere and shelf life of ackee fruit. Acta Hort. 1225, 173-182.

DOI: 10.17660/ActaHortic.2018.1225.23

Abstract

BreatheWay® membrane technology is a temperature responsive modified atmosphere packaging (MAP) system. The effect of BreatheWay® microporous patch coated with a polymer mixture was investigated on the arils of ackee fruit stored at 5, 10 or 15°C. The CO₂ in packages of arils stored at 5°C MAP decreased from 1.53 to 0.52%, while control increased from 0.37 to 0.43% over 10 days of storage. The CO₂ in packages of arils stored at 10°C remained at 1.82%, while 10°C control averaged 0.57% during 10 days of storage. The O₂ in MAP 10 days after storage at 5 and 10°C increased from 16.61 to 20.21% and 14.19 to 17.84%, respectively, while O₂ in control packages remained at atmospheric concentrations. The packages stored at 15°C were removed and assessed after 5 days of storage due to the presence of fungal mycelium. The C₂H₄ varied significantly ($P \leq 0.05$) between MAP and control for the storage temperatures of 5, 10, and 15°C. There was no significant difference in aril hue (H*) angle before and after the storage period for the temperatures of 5, 10, and 15°C. The arils stored at 5°C lost firmness but arils stored at 10 or 15°C remained at 2.5 kgf. Thus, quality attributes of ackee arils can be maintained for about 10 days postharvest with regulation of temperature and the use of BreatheWay® membrane technology.

Keywords: *Blighia sapida* /postharvest handling/ /underexploited fruits/

APPLE

Ranjbar S., Rahemi M., Ramezani A. (2018). Comparison of nano-calcium and calcium chloride spray on postharvest quality and cell wall enzymes activity in apple cv. Red Delicious. Scientia Horticulturae, 240: 57-64.

DOI: 10.1016/j.scienta.2018.05.035

Abstract

The aim of the experiment was to compare the effects of preharvest nano-calcium and calcium chloride spraying on postharvest quality and the cell wall enzyme activities of the apple fruit (*Malus domestica* L. cv. Red Delicious) at harvest and during storage (1, 2, 3, 4 month). Spraying on apple trees were started from 70 d after full-bloom until one month before harvesting. They were sprayed 5 times, intervals of two weeks, with nano-calcium (0, 1.5, 2, and 2.5%), and calcium chloride (0, 1, 1.5, and 2%) solutions. After harvest, some fruit were transported to the laboratory to evaluate the parameters while other fruit were stored at 0 °C and at 90% RH for 4 months. Measurements were performed on fruit firmness, weight loss, titrable acidity (TA), total soluble solids (TSS), total phenolic content (TPC), browning, total antioxidant

activity (TAA), and fiber content at 0, 1, 2, 3, and 4 months of storage period. Furthermore, assessments were made regarding enzymes in the cell wall such as polygalacturonase (PG), pectin methylesterase (PME), and β -galactosidase (β -Gal). Results showed that firmness, TA, TPC, TAA, and fiber content increased in fruit that treated with both nano-calcium and calcium chloride as compared to control fruit, however, these parameters decreased by prolonging the storage time. Meanwhile, weight loss, TSS, and internal browning increased during storage time, but, this increase in treated fruit was less than control fruit. Moreover, during storage, lower activities of PG, PME, and β -Gal enzymes were observed in fruit that sprayed with both calcium fertilizers. In addition, In short, it was observed that the quality of apple fruit treated with nano-calcium was better than those treated with calcium chloride in all parameters. So, it can be considered to use nano-calcium fertilizer instead of calcium chloride fertilizer for improving quality and storability of fruit such as apple.

Keywords: / β -galactosidase/ /Fertilization/ /Nano/ /Pectin methylesterase/ /Physicochemical/ /Polygalacturonase/

Niu, J. P., Hou, Z., Hui, W., and Ou, Z. (2018). Comparative study of effects of resveratrol, 1-MCP and DPA treatments on postharvest quality and superficial scald of 'Starkrimson' apples. Scientia Horticulturae, 240: 516-521. DOI: 10.1016/j.scienta.2018.06.037

Abstract

The effects of resveratrol (Res), 1-MCP and DPA on quality and superficial scald of 'Starkrimson' apples were studied in this paper. The results showed that all treatments maintained firmness and SSC, inhibited α -farnesene and conjugated trienes, but there were no significant differences in treatments. Each treatment markedly inhibited the increase of relative membrane permeability, MDA content and PPO activity, whereas improved POD activity of the skin tissues, but it didn't occur remarkable differences in treatments. After 210 d at 0 °C and 210 d plus 10 d at 20 °C, each treatment obviously inhibited scald, but it almost had no significant difference in treatments. Hence, Res has similar effects with 1-MCP and DPA in maintaining quality and inhibiting superficial scald in 'Starkrimson' apples during storage and shelf life. It is likely to be a new preservative with safe and non-toxic effects, and it can be a potential substitute for 1-MCP and DPA.

Keywords: /Resveratrol/ /1-MCP/ /DPA/ /Postharvest quality/ /Superficial scald/ /Apple/

APRICOT

Öztürk, B., Saritepe, Y., Öztürk, K., Didin, M. and Konak, R. (2018). Storage of apricot 'Hacıhaliloglu' under modified atmosphere and cold storage conditions. Acta Horti, 1214: 151-158 DOI: 10.17660/ActaHortic.2018.1214.25

Abstract

Apricot 'Hacıhaliloğlu' at two different maturity periods was used in this study. This study was carried out at cold storage of 0-1°C and relative humidity of 90-95% in Fruitage Research Institute laboratories. The effects of two different maturity periods, three different packaging materials (A, B and C from different brands), and two different packaging sizes (500 and 4000 g) were examined in the present study. Changes in physical, chemical and sensory properties of the apricots were examined, including tenderness, the amount of dried material, acidity, pH, color, loss of weight, taste, and shelf life of apricots during storage. Samples of the normal maturity period in larger size packages were able to be analyzed only up to 10 weeks due to spoilage; therefore, statistical analysis of these samples was done by using the data for 10 weeks. The other treatments at different maturity and in different packages were analyzed using data collected up to 13 weeks. Changes in quality and taste were not apparent for all treatments up to week 7. Differences in loss of weight of apricots were not significant for packages B and C. Use of packaging A showed 2.5% loss of weight between the first and last weeks of the study. The amount of dried material, acidity, and texture of the samples decreased, whereas the pH of the samples increased. The early harvested samples were found to be of better quality than the samples harvested at the normal maturity period. The quality of samples was found to be better in packages A and B, whereas treatment C was found to be better for taste criteria. The results for taste and quality of treatments showed that small packages were found to be better than larger packages.

Keywords: /fresh apricot/ /package/ /cold storage/ /shelf life/

Christen, D., Gabioud Rebeaud, S., Cotter, P.-Y. and Gasser, F. (2018). Influence of fruit maturity, 1-methylcyclopropene (1-MCP) treatment and storage temperature on ethylene production and firmness of 'Goldrich' and 'Orangered' apricots. Acta Horti, 1214: 159-164

DOI: 10.17660/ActaHort.2018.1214.26

Abstract

Apricots are climacteric fruits characterized by a fast ripening process after harvest. To avoid fruit quality losses during storage, transport and distribution, fruits are often harvested at an unripe maturity stage, resulting in lower sensory quality and higher heterogeneity of the batches in the supply chain. The aim of this study was to evaluate the influence of two ripening stages at harvest, two storage temperatures (1 and 8°C), and 1-methylcyclopropene (1-MCP) treatment on apricot quality and ethylene production of the cultivars Goldrich and Orangered. Fruit were stored under regular atmosphere (92% relative humidity). During storage and shelf life, firmness was the highest evolving parameter compared to acidity, sugar content and skin colour. The ripening stage of the fruits highly influenced the decrease in firmness during storage. Firmness decrease was 10 to 20% lower for unripe fruits, and no firmness decrease was observed for unripe Orangered. The same tendencies were observed with ethylene production. Climacteric rise was influenced by the fruit ripening stage and was delayed (5 days) for unripe fruits. Unripe Orangered did not produce ethylene; probably due to the non-activation of ethylene biosynthesis genes in unripe fruits. The influence of 1-MCP treatment on firmness change and ethylene production differed depending on the measurement moment: no influence was observed directly after storage, whereas, after 3 days of shelf-life, fruit softening and ethylene production were reduced by using 1-MCP. In contrast, storage temperature highly influenced

firmness and ethylene production, exhibiting a 20% higher softening and an earlier (>20 days) climacteric rise at 8°C compared to 1°C for Goldrich. For Orangered, ethylene production began after 7 days of storage, independently of the temperature. The interactions between the different influencing factors, as well as potential recommendations for the apricot supply chain actors, are discussed.

Keywords: /Prunus armeniaca/ /optimal harvest date/ /postharvest evolution and fruit quality/

BANANA

**Nguyen, L.P.L., Szabó, G., Hitka, G., Zsom, T., Tóth, A., Németh, C. and Kókai, Z. (2018). Effect of ethylene absorber on banana during storage. Acta Horti, 1216: 55-58
DOI: 10.17660/ActaHortic.2018.1216.7**

Abstract

This study was aimed to investigate the effect of ethylene absorber (EA) on postharvest life of banana stored at 20 and 14°C, respectively, at 95% relative humidity. Bananas were stored with sachets of commercially available product named Ethyl Stopper: EA containing KMnO₄ on an inert substrate (Bioconservacion S.A., Spain). EA could delay the senescence of banana by reducing the ethylene concentration in the storage chambers. The use of EA reduced the weight loss of banana by 2% compared to the control samples. Moreover, samples stored with EA at 14°C showed less disease severity than other treatments after 16 days of storage. No chilling injury was observed throughout storage at 14°C. The combination of cold temperature and EA delayed the yellowing of banana and disease development in comparison with the other treatments during 16 days of storage. Results presented a potential of using EA during storage of banana.

Keywords: /banana/ /ethylene absorber/ /KMnO₄/ /storage/

**Murmu, S. B., & Mishra, H. N. (2018). Post-harvest shelf-life of banana and guava: Mechanisms of common degradation problems and emerging counteracting strategies. Innovative Food Science and Emerging Technologies, 49: 20–30.
<https://doi.org/10.1016/j.ifset.2018.07.011>**

Abstract

Banana and guava have short shelf-life at tropical ambient temperature due to climacteric ripening associated changes like rapid softening, senescence spotting, off-odor development, anthracnose, and crown rot disease incidence, and chilling injury occurrence during storage below 13 °C. Commercially post-harvest treatment involved submerging banana and guava in solutions of benomyl or thiabendazole or imazalil. These chemicals are harmful to human health and the environment. Moreover, the fungal pathogens have developed resistance to these fungicides. Hence search of alternative non-chemical, health and environment friendly strategies are major focus of the researchers over the world. Treatment with organic acids, plant

extract having antimicrobial properties prevented diseases either by direct action on the fungus or by inducing defense response by increasing the activity of antioxidant enzymes like superoxide dismutase, lipoxygenase, catalase. Degradation of plant parts occurs due to accumulation of reactive oxygen species and enzymatic oxidation of polyphenols during senescence, chilling stress, low oxygen, or high carbon dioxide injury. The deteriorations are evaluated by physical parameters like color change, accumulation of superoxide anion, hydrogen peroxide, malondialdehyde byproducts, accumulation of thiobarbituric reactive compound and ion leakage percentage. The selection of application concentration and treatment duration of 1-methylcyclopropane (1-MCP) treatment which act as an ethylene inhibitor is critical in extending shelf-life of banana and guava. The modified atmosphere, controlled atmosphere storage and edible coating reduced time to occurrence and intensity of climacteric peak respiration, slowed down ripening associated changes, prevented accumulation of reactive oxygen species (ROS) thereby extended shelf-life of guava and banana.

Keywords: /Chilling injury/ /1-MCP/ /Controlled atmosphere storage/ /Modified atmosphere packaging/ /Edible coating/

Piedad, E. J., Larada, J. I., Pojas, G. J., and Ferrer, L. V. (2018). Postharvest classification of banana (*Musa acuminata*) using tier-based machine learning. *Postharvest Biology and Technology*, 145: 93-100.

DOI: 10.1016/j.postharvbio.2018.06.004

Abstract

Manual classification of horticultural products contributes to postharvest losses but technology and emerging algorithms offer solutions to reduce such losses. A practical fruit classification of banana (*Musa acuminata* AA Group 'Lakatan') using machine learning is developed based on tier-based classification instead of classifying individually ("finger") for practical purpose. Fruit were classified into extra class, class I, class II and reject class, and compared using three widely-used machine learning classifiers – artificial neural network, support vector machines and random forest. Given only four features of banana tier, the red, green, blue (RGB) color values and the length size of the top middle finger of the banana tier, all three models performed satisfactorily. The highest classification accuracy of 94.2% was achieved using random forest classifier. In addition, ignoring the reject class, which cannot be easily predicted using only the given features, at least 97% accuracy can be achieved in all other three classes. Non-invasive tier-based classification is a practical postharvest technique that can be applied not only for banana but also for other fruit and horticultural products.

Keywords: /Banana tier/ /Fruit classification/ /Musa acuminata/ /Machine learning/

BELL PEPPERS

Bagnazaria, M., Saidia, M., Mohammadib M., Khademic, O., and Nagarajad, G. (2018). Pre-harvest CaCl₂ and GA₃ treatments improve postharvest quality of green bell peppers (*Capsicum annum* L.) during storage period. *Scientia Horticulturae*, 240: 258-267.

DOI: 10.1016/j.scienta.2018.06.043

Abstract

The present study investigated the effects of CaCl₂ (0.5%) and GA₃ (0.05 g L⁻¹) pre-harvest treatments both at two (2T) and three spraying times (3T) on some qualitative characteristics of green bell pepper stored for 0, 10 and 20 d at 1 and 10 °C. The purpose of this study was to mitigate postharvest lesions and increase chilling injury resistance in peppers. Weight loss, firmness, total soluble solids (TSS), vitamin C (VitC), phenolics, electrolyte leakage (EL), malondialdehyde (MDA), chilling injury, chlorophyll and calcium contents, peroxidase (POD), catalase (CAT) and antioxidant activities were measured. The highest and lowest weight losses were observed after 20 d at 1 and 10 °C on control and CaCl₂ treatments respectively. The highest (30.8 at 1 and 21.4 N at 10 °C) and lowest (23.5 at 1 and 14.2 N at 10 °C) firmness was measured in fruit from the CaCl₂ (3T) treatment and control, respectively. The amount of VitC and phenolics were higher in the control compared to all other treatments. After 20 d, the highest amount of MDA and EL, as well as the lowest amounts of calcium were measured in the control, gibberellin and calcium treatments, respectively. Chilling injury increased after 20 d of storage at 1 °C. However, all treatments with no significant difference had less chilling injury and TSS and more antioxidant enzymes (POD and CAT) and chlorophyll than the control. The results reveal that all CaCl₂ and GA₃ treatments increased overall quality of pepper at harvest time and preserved the quality and reduced the chilling injury during the storage period. Hence, these treatments can be commercially effective strategy to improve shelf life and maintain the quality of green bell pepper fruit during harvest and postharvest.

Keywords: /Green bell pepper/ /Calcium ions/ /Gibberellic acid/ /Pre-harvest treatment/ /Chilling injury/ /Shelf life/

CHERRY

**Kiprovski, B., Borković, B., Malenčić, D., Veberič, R., Štampar, F., and Mikulič-Petkovšek, M. (2018). Postharvest changes in primary and secondary metabolites of sweet cherry cultivars induced by *Monilinia laxa*. *Postharvest Biology and Technology*, 144: 46-54
DOI: 10.1016/j.postharvbio.2018.05.012**

Abstract

The aim of the study was to evaluate in which way nine cultivars of sweet cherry fruit cope with postharvest, artificial inoculation with *Monilinia laxa* pathogenic fungus through changes in sugars, organic acids and polyphenolic compounds, as well as which phenolics compounds are crucial participants in coping with the disease. Contents of sugars in this study were (g kg⁻¹ dry weight): glucose 205–439 and 268–443, fructose 175–398.9 and 208.6–365.8 and sucrose 20–47.6 and 19.2–38.6 in healthy and infected fruit, respectively. Organic acids detected in sweet cherry cultivars were citric, malic, quinic, shikimic and fumaric acid and their content varied depending on cultivar and treatment. Only 'Burlat' accumulated tartaric acid after the infection. Of all phenolic acids, which content decreased in infected fruit, it is clear that only the more tolerant genotypes 'Merchant', 'Lionska', and 'Sue' enhanced content of 3-feruloylquinic acid (in healthy up to 93 and in infected fruit 105.3–139.1 mg kg⁻¹). The most abundant

anthocyanins were cyanidin derivatives (80–266.1 and 10–3700 mg kg⁻¹ in healthy and infected fruit, respectively). ‘Burlat’, ‘Junska rana’, Merchant’ and ‘Summit’ dominantly had cyanidin-glucoside, while only infected fruit of ‘Priusadebnaja’ and ‘Asenova rana’ accumulated cyanidin-glucoside. ‘Priusadebnaja’, ‘Asenova rana’ and ‘Lionska’ had cyanidin-rutinoside. ‘Lionska’, ‘Sue’ and ‘Asenova rana’ had higher cyanidin and peonidin derivative contents in infected fruit (1.2 to 3-fold higher). Peonidine derivatives (peonidin glucoside and rutinoside), 5-carboxypyranocyanidin-rutinoside content mostly decreased after the infection (14.9–97.7 %). Bearing in mind obtained results, 3-feruloylquinic acid, flavonols and anthocyanins could be proposed as crucial participants in coping with the disease.

Keywords: /Monilinia rot/ /Organic acids/ /Polyphenolics sweet cherry/ /Sugars/

FLOWERS

do Nascimento Simoes A., Diniz N.B., da Silva Vieira M.R., Ferreira-Silva S.L., da Silva M.B., Minatel I.O., Lima G.P.P. (2018). Impact of GA3 and spermine on postharvest quality of anthurium cut flowers (*Anthurium andraeanum*) cv. Arizona. Scientia Horticulturae, 241: 178-186.

DOI: 10.1016/j.scienta.2018.06.095

Abstract

Anthurium cut flowers exposed to low temperatures may be subjected to chilling injury, whereas higher temperatures may accelerate their metabolism and induce premature senescence. Plant growth regulators, as gibberellic acid (GA3) and spermine (SPM), have been described to extend the postharvest life of flowers. In this study, both compounds were applied by spraying or pulsing in anthurium cv. Arizona before storage at 20 °C. The solutions were constituted of 144 µM GA3 and 2 µM SPM, which were used separately or in combination, and analyzed for 12 d. Spraying with GA3 + SPM extended the vase life and kept the commercial quality. These treatments increase the phenols content, as well as, the activity of polyphenol oxidase (PPO), peroxidase (POD), and superoxide dismutase (SOD). Spadix sprayed with GA3 or SPM retained high amounts of spermidine (SPD), and in the combination of GA3 + SPM, there were higher contents of spermidine. These results suggest that the application of GA3 + SPM by spraying can be used to reduce the senescence in anthurium cut flowers stored at 20 °C, and improve the commercial quality of the inflorescences.

Keywords: /Storage commercial quality/ /Polyphenol oxidase/ /Peroxidase/ /Superoxide dismutase/ /Polyamines/

GRAPEFRUIT

Olarewaju, O. O., Magwaza, L. S., Fawole, O. A. Tesfay, S. Z., and Opara, U. L. (2018). Comparative effects of canopy position on physicochemical properties of ‘Marsh’ grapefruit during non-chilling postharvest cold storage. Scientia Horticulturae, 241: 1-7.

DOI: 10.1016/j.scienta.2018.06.074

Abstract

The physicochemical properties of citrus fruit play critical roles in its maturity and quality determination. Hence, this study investigated the effect of canopy position on physicochemical properties of 'Marsh' grapefruit across different production regions at harvest and after storage at 7.5 °C for 3, 6, and 9 weeks. The study also evaluated the use of BrimA as an adoptable internal quality and maturity parameter for 'Marsh' grapefruit. Fruit from inside canopy (IC) and outside canopy (OC) were harvested from KwaZulu-Natal (KZN) and Mpumalanga (MP) provinces in South Africa. Titratable acidity was determined by titration and calculation of the sugar/acid ratio (TSS/TA) was established while BrimA was derived from sugar and acid with tongue sensitivity index. Colour indices were measured using calibrated colorimeter while sugars were measured using high performance liquid chromatography (HPLC). At harvest, IC fruit from MP province were more luminous than the OC fruit while inverse results were recorded for fruit from KZN. At harvest, IC fruit had higher percentage of titratable acidity (TA) (2.73%) than OC fruit (2.40%) from MP, with opposite results from KZN. The BrimA showed a strong and positive correlation with TSS/TA ($r = 0.9364$). Overall, our result suggested that canopy position affect some physicochemical properties of 'Marsh' grapefruit. However, harvested fruit displayed a high level of maturity and quality over the period of cold storage. BrimA could potentially be used as an index of internal quality of grapefruit but further studies into the subject is required.

Keywords: /Acidity/ /BrimA/ /Citrus spp./ /Citrus paradise/ /Fruit quality/ /Rind colour/

Olarewaju, O.O., Magwaza, L.S., Fawole, O.A., Tesfay, S.Z., Cronje, P.J.R. and Opara, U.L. (2018). Postharvest rind colour and antioxidant composition of 'Marsh' grapefruit harvested from different canopy positions of the tree. Acta Hort. 1225, 227-232. DOI: 10.17660/ActaHortic.2018.1225.31

Abstract

Rind biochemical composition affects citrus fruit response to postharvest physiological stresses. Effect of canopy position within the tree on rind colour and antioxidant composition of Marsh grapefruit was investigated during 9 weeks of postharvest storage. Fruit from inside canopy (IC) and outside canopy (OC) were harvested from KwaZulu-Natal (KZN) and Mpumalanga (MP) provinces in South Africa. Colour indices were measured using calibrated colorimeter while total phenolics concentration (TPC) was determined by Folin-Ciocalteu method. Canopy position had significant effect on fruit rind quality. At harvest, OC fruit from Mpumalanga province were more luminous ($L^* = 83.1$) than IC fruit ($L^* = 81.1$). At KZN IC fruit were less luminous ($L^* = 78.9$) compared to OC fruit ($L^* = 79.8$). The albedo of OC fruit from KZN had higher levels of TPC (2.9 mg gallic acid equivalent GAE g⁻¹) than IC fruit (2.8 mg GAE g⁻¹). This trend was observed at subsequent sampling times during postharvest storage until week 6 when the maximum TPC in OC (4.9 mg GAE g⁻¹) and IC fruit (3.8 mg GAE g⁻¹) were reached, followed by a decline. Conversely, OC fruit from MP had lower TPC (2.1, 2.3, 2.9, 2.5 mg GAE g⁻¹) than IC fruit (2.3, 2.9, 2.9, 2.8 mg GAE g⁻¹) at weeks 0, 3, 6 and 9 in cold storage, respectively. However, TPC of the flavedo followed a consistent increasing trend until week 6, followed by a decline. OC fruit had higher flavonoids concentration (0.6 and 0.7 mg quercetin equivalent (QTE) g⁻¹) than IC fruit (0.5 and 0.5 mg QTE g⁻¹) from KZN and MP, respectively. This study provides baseline information to improve the understanding of how canopy position affects rind quality.

Keywords

citrus fruit, flavonoids, rind colour, rind quality, total phenolic

GRAPES

Romero, I., Casillas-Gonzalez, A. C., Carrazana-Villalba, S. J., Escribano, M. I. (2018). Impact of high CO₂ levels on heat shock proteins during postharvest storage of table grapes at low temperature. Functional in vitro characterization of VviHSP18.1. *Postharvest Biology and Technology*, 145: 108-116. DOI: 10.1016/j.postharvbio.2018.06.006

Abstract

The role played by heat shock proteins (HSPs) in improving fruit quality during postharvest treatments has mainly been studied regarding heat treatments, while little is known about the effect of CO₂ treatments. In this study, we have analyzed the gene expression of five heat shock proteins (HSPs) and one heat shock factor (HSF) in the skin of red table grapes (*Vitis vinifera* cv. Cardinal) to determine whether a pretreatment with high CO₂ levels (20 kPa) modulated their expression and how the length of the treatment (1 or 3 d) could influence this change. The 3-d high CO₂-treatment was effective in reducing total decay and induced the accumulation of three small HSPs (VviHSP18.1, VviHSP18.2 and VviHSP22.0), whereas VviHSP70.0 and VviHSF4-a gene expression were induced by both treatments. To shed light on the putative physiological role of a small HSP (VviHSP18.1) acting as a chaperone, the recombinant protein was overexpressed in *Escherichia coli*. It was then purified and mass spectrometry confirmed that the isolated protein was VviHSP18.1, belonging to class I sHSP. Although the purified protein was stable at different high temperatures, when temperature was above 70 °C, a weaker and smaller protein band appeared which was identified by mass spectrometry as VviHSP18.1 with a C-terminal truncation. The recombinant VviHSP18.1 protein displayed chaperone activity which protects citrate synthase (CS) and malate dehydrogenase (MDH) from thermal aggregation at 45 °C, and also displayed the protection of alcohol dehydrogenase (ADH) and lactate dehydrogenase (LDH) activities at 55 °C and 65 °C, respectively. By contrast, VviHSP18.1 did not protect LDH from freezing-induced inactivation. Taken together, these results support the hypothesis that a high CO₂ treatment is an active process where HSPs could participate in preventing the denaturation and dysfunction of different proteins.

Keywords: /Heat shock proteins/ /Vitis vinifera/ /Carbon dioxide/ /Low temperature/ /Chaperone activity/

HAZEL NUTS

Turan, A. and İslam, A. (2018). Postharvest differences between 'Tombul' and 'Palaz'. *Acta Hort.* 1226, 351-358. DOI: 10.17660/ActaHortic.2018.1226.53

Abstract

The aim of this study was to determine the physical traits of hazelnuts dried by different drying methods during 18 months of storage at 20-25°C and 70-90% RH. The results showed that there was no significant difference among drying methods. However, Tombul was more sensitive than Palaz in respect to the presence of rotten kernels, moldy kernels and yellowing. The average changes in measured properties during the storage were 1.82-2.06 for nut weight and 0.89-1.08 g for kernel weight, 2.44-2.86 mm for kernel cavity, 54.5-59.9 for kernel percentage, 96.7-100 for fully developed nuts, 8.7-16.7 for shriveled, 6.7-10.0 for black tips, 0.0-3.3 for rotten, 0.0-2.2 for concealed rots, 0.0-12.2 for moldy, 0.0-4.4 for invisible mold, 1.40-24.4 for yellowing, 0.0-7.8 for sour taste, and 10.0-20.0% for kernel defects. Consequently, inshell hazelnuts can be stored at ambient temperature for one year without significant changes in physical properties.

Keywords: /hazelnut drying machine/ /concrete ground/ /grass ground/ /yellowing/

**Üstün, N.Ş., Karaosmaoğlu, H. and Turan, A. (2018). Risks and solutions for harvesting, storage and processing of organic hazelnuts. Acta Hort. 1226, 365-368
DOI: 10.17660/ActaHortic.2018.1226.55**

Abstract

Today, poor nutrition is among the major contributors to obesity, diabetes, cancer and cardiovascular disease. Consumers have become aware of the importance of nutrition and are demanding a safe food supply. In response to the demand for healthy, high-quality food, organic products are being produced in larger quantities. The most important organic products that Turkey grows and exports are dried grapes, dried figs, frozen fruits, apricots, and hazelnuts. When the value of kernels and processed hazelnut products are combined, the most important and most profitable organic product is hazelnut. Organic hazelnut production is concentrated in the coastal zone of the Black Sea Region. In recent years, the organic hazelnut production has increased in response to an increased demand. In organic food production, food safety risks include pesticides, chemicals, environmental pollutants, nitrates, natural toxins, pathogens and mycotoxins. In this study, the harvesting, storage and processing methods for organic hazelnuts are compared with those of conventionally-grown hazelnuts.

Keywords: /Corylus avellana/ /food safety/ /environmental pollutants/ /organic food/ /conventional food/

KIWIFRUIT

**Fadanelli, L., Turrini, L., Zeni, F., Mattè, P. and Buglia, L. (2018). New scientific knowledge in kiwifruit storage using sanitization systems (Lonny®) avoiding postharvest chemical treatments. Acta Hort, 1218: 511-516
DOI: 10.17660/ActaHortic.2018.1218.70**

Abstract

Loss of produce during commercial kiwifruit storage is so high as to require the adoption of specific techniques and preventive measures. Postharvest curing techniques alone are not sufficient to guarantee valid economic results, particularly when fruits are harvested in high-humidity environmental conditions due to rain or heavy dew. The incidence of rot due to *Botrytis* spp. penetrating the pulp at the detachment point of the stalk can reach high percentages (10-20% of damaged fruit), and specific postharvest chemical treatment known as drenching is required. As verified in the past, an alternative to the use of chemicals, with air sanitation of the storage environment using an ionizer (lonny®), is possible. Tests carried out during the 2016-17 season have confirmed the validity of this technique in CA storage conditions (-0.5/-0.7°C, RH>90%, CO₂ 3-4%, O₂ 2.5-3%, C₂H₄<0.02 ppm) alongside curing, with results comparable to those obtained using the chemical treatment fenhexamid in a drencher. A batch of Hayward kiwifruit produced in the Trentino (Italy) area was divided into three groups: 1) treatment with fenhexamid + curing + CA; 2) curing + CA in an ionized environment; and 3) no treatment + curing + CA (TEST). The trial found over 15% of fruits infected with *Botrytis* spp. in group 3, and 100% healthy fruits in groups 1 and 2. These results, as well as confirming the outcome of previous trials, have also highlighted that group 2 (CA storage with air sanitized by lonny®) produced the best results (firmness, total acidity) both at the end of storage and also after 8 d shelf-life at room temperature.

Keywords: /technology/ /ionizer/ /microbial infection/ /safety/ /postharvest defense/

LONGAN

**Hai, L.H. and Uthaibutra, J. (2018). Effect of oxalic acid on visual appearance and quality of 'Long' longan fruit during low temperature storage. Acta Horti, 1213: 161-170
DOI: 10.17660/ActaHorti.2018.1213.21**

Abstract

The impacts of oxalic acid on the visual appearance and quality of Vietnamese Long longan fruits during low temperature storage, was studied by soaking fruits in 5 and 7.5% oxalic acid solutions for 5 min at room temperature, and then storing them at 5±1°C for 30 days. Untreated fruits were used as control. The visual appearance expressed as browning index, and pericarp color including the lightness of fruit pericarp (L* value) and the yellowness of fruit pericarp (b* value); pericarp pH; the percentage of fruit decay; total soluble solids (TSS) content were studied. The results showed that the 5 min soaking treatment in 7.5% oxalic acid solution could delay pericarp browning for 25 days in storage which was indicated by the lowest browning index, and high L* and b* values. Moreover, this treatment maintained low pericarp pH and fruit decay, and the TSS content of longan fruit revealed no difference overtime.

Keywords: /'Long' longan/ /oxalic acid/ /pericarp browning/ /fruit decay/

**Apai, W., Likhitragulrungs, S., Jaroensuk, S., Rattanakam, S. and Amareok, S. (2018). Effects of fruit dipping in sodium metabisulfite acidified with hydrochloric acid on quality of fresh longans during cold storage. Acta Horti, 1213: 201-206
DOI: 10.17660/ActaHorti.2018.1213.26**

Abstract

The objective of this study was to determine alternative treatment to sulfur dioxide (SO₂) gas fumigation to prolong storage life of longan for export. The sodium metabisulfite (SMS) dip technique was improved to correct problems of fruit wetting during either rainy or winter seasons, which constrained SO₂ fumigation and may cause high residue in fruit. The experiment was to compare the effectiveness between SMS 5% containing HCl, SO₂ and HCl alone on residue in fruit including fruit quality during cold storage. The longan fruit with panicle attached were packed in 11.5-kg perforated plastic baskets and washed with clean water before dipping. The fruits were dipped in a solution of SMS 5% + HCl 1% (pH 0.93) for 5 min and compared with fruits fumigated with SO₂ and dipped in HCl 6.4% + NaCl 1% + Tween 20 (wetting agent) 0.1% for 5 min, then air dried for 2 h and stored at 6°C for 42 days. The control was untreated fruit. Results indicated that dipping in SMS 5% + HCl 1% (pH 0.93) for 5 min as well as SO₂ and HCl showed no sign of pericarp browning and retained the highest value of pericarp color; the lightness of fruit pericarp (L* value) and the yellowness of fruit pericarp (b* value) including fruit decaying control when stored at 6°C for 42 days. Dipping in SMS 5% + HCl 1% (pH 0.93) maintained a higher score of consumer acceptance in fruit pericarp than SO₂ according to the highest greenness value (the lowest a* value). This treatment also maintained a high score of consumer acceptance in flesh fruit quality, both aroma and taste, for 28 days, whereas for SO₂ it was for 21 days. Moreover, there were no significant changes in some parameters in any treatment; SMS+HCl and SO₂ during storage, i.e., SO₂ residue in fruit flesh (except for the first days of storage for SO₂ treatment), flesh pH, total soluble solid (TSS), titratable acidity (TA) and weight loss percentage. In conclusion, dipping in SMS 5% + HCl 1% (pH 0.93) could be used for extending the shelf life of longan for export and for correcting wet fruit problems caused by rain or mist because it maintained superior fruit pericarp color, less SO₂ residue in flesh and consumer acceptance compared with the conventional method.

Keywords: /sodium metabisulfite/ /sulphur dioxide/ /muriatic acid/ /commercial practice/ /consumer acceptance/

MANGO

**Joomwong, A., Joomwong, J., Noimanee, P. and Theanjumol, P. (2018). Thai mango and pineapple fruit changed during postharvest management. *Acta Horti*, 1213: 225-228
DOI: 10.17660/ActaHort.2018.1213.30**

Abstract

The objective of this research was to determine the changes to Thai mango and pineapple fruit during postharvest management. Nam Dok Mai Si Thong Thai mango fruit were harvested at three stages, immature (0-7 days), mature, (commercial maturity, 0 days) and over-mature (0+7 days). After selection, all fruits were carried to the laboratory and were separated into two groups. The fruit in the first group were measured immediately for their physical and chemical properties. Those in the second group were left at room temperature (30-35°C) for the completion of the ripening process at which time they were measured as for the first group. In the case of PhuLae pineapple fruit, they were harvested at commercial maturity and kept at room temperature (30-35°C) for 10 and 25 days. The fruit were sampled to measure the

physical and chemical properties at the initial time, then at 10 days and 25 days. The results revealed that effects of the maturity stages on dimension and weight of green and ripe mango fruit were not clear. The total soluble solids (TSS) and ratio of TSS and TA (TSS/TA) were increased. On the other hand, titratable acidity (TA) was decreased. The dimension and weight of the pineapple fruit tended to decrease during storage. TSS and TA were slightly decreased whereas TSS/TA increased. Therefore, the properties of both types of fruit changed during postharvest management and these findings will be used as the basic data in the advance study, to assess their quality by portable NIR.

Keywords: /mango/ /pineapple/ /fruit quality/ /postharvest/

Kwanhong, P., Srithanyarat, S., Songchan, K. and Singto, J. (2018). Effects of 1-MCP and packaging on quality and shelf-life of 'Nam Dok Mai No. 4' mango fruits. Acta Horti, 1216: 45-54

DOI: 10.17660/ActaHortic.2018.1216.6

Abstract

Mango fruits are liable to postharvest losses and reduced quality. In order to minimize the postharvest losses, maintain the quality and extend shelf-life, postharvest treatments are given to the fruits after harvest. This study aimed to observe the effect of different concentrations of 1-methylcyclopropene (1-MCP) and packaging on quality changes and storage life of 'Nam Dok Mai No. 4' mango fruits (*Mangifera indica* L.). The fruits harvested at fully mature-green stage were treated with 0 (control), 1, 1.5 and 2 $\mu\text{L L}^{-1}$ of 1-MCP for 6 h at 20°C. Then, the fruits were packed with three types of packaging (covering with polyethylene [PE] foam net, wrapping the fruit with polyvinyl chloride [PVC] stretch film before covering with PE foam net, or placing the fruit with PE foam net into perforated polyethylene plastic bags) inside corrugated boxes. All the treated fruits were stored at 13°C with 90% of relative humidity. The results indicated that both 1-MCP treated and untreated mango fruits covering with PE foam net had higher weight loss than other packaged fruits. Fruit firmness decreased more slowly in 1-MCP-treated fruits than in untreated fruits. Moreover, compared to untreated fruits, fruits with 1-MCP treatments still ripened as usual but the treated fruits delayed their ripening and had a longer storage life. The mangoes treated with 2 $\mu\text{L L}^{-1}$ 1-MCP had the longest storage life of 34 days. In addition, 1-MCP treatment combined with PVC film or perforated PE bags could reduce weight loss and prolong storage life of mango fruits up to 37 days without a difference in quality. Their eating quality was still acceptable.

Keywords: /1-methylcyclopropene/ /package/ /*Mangifera indica* L./ /fruit ripening/ /storage life/

Ambuko, J., Karithi, E., Hutchinson, M., Wasilwa, L., Hansen, B. and Owino, W. (2018). Postharvest shelf life of mango fruits stored in a Coolbot™ cold room. Acta Horti. 1225, 193-198.

DOI: 10.17660/ActaHortic.2018.1225.25

Abstract

The Coolbot™ technology is an innovative cold storage technology promoted among smallholder farmers as a low-cost alternative to conventional cold rooms. The objective of the present study was to establish the efficacy of a Coolbot™ cold room to preserve quality and extend shelf life of mango fruits. The study was conducted in a participatory approach with smallholder mango farmers in Makueni County of Kenya between 2014 and 2015. Fruits of a popular mango cultivar (Apple) were harvested from commercial farms, selected for uniformity and separated into two batches of 100 fruits each. One batch was stored in the Coolbot™ cold room with the temperature set at $10\pm 2^{\circ}\text{C}$. The second batch was stored at ambient room temperature ($24\text{-}35^{\circ}\text{C}$). A random sample of five fruits was drawn from each storage condition every three days to evaluate ripening-related changes including, respiratory activity, peel/flesh color and firmness, total soluble solids, titratable acidity and weight loss. The shelf life of mango fruits which were stored in the Coolbot™ cold room was extended by 23 days compared to fruits under ambient room conditions. Cold storage significantly ($p < 0.05$) reduced the respiratory activity of the stored fruits. At the end stage (day 12) Apple mango fruits stored at ambient room conditions had a respiration rate of $53.9 \text{ mL kg}^{-1} \text{ h}^{-1}$ compared to $40.5 \text{ mL kg}^{-1} \text{ h}^{-1}$ for cold-stored fruits. The lower respiration rate was mirrored positively in other ripening-related changes including peel/flesh firmness and colour confirming the efficacy of the Coolbot™ technology as a low-cost alternative to the expensive conventional cold rooms.

Keywords: /*Mangifera indica*/ /cold chain/ /Kenya/ /postharvest quality/

Akinyemi, S.O.S., Fajinmi, O.B. and Oduntan, A.O. (2018). Influence of fruit coating and storage on ripening, spoilage and fruit quality of *Mangifera indica*. Acta Hort. 1225, 217-220.

DOI: 10.17660/ActaHortic.2018.1225.29

Abstract

To determine a sustainable method of prolonging shelf life of mango fruits, a study was conducted to investigate the influence of coating and other methods of storage on fruit ripening, spoilage and quality of *Mangifera indica* 'Saigon'. The fruits were collected from the mango orchard of National Horticultural Research Institute Ibadan, Nigeria at matured green stage. They were subjected to different treatments: (i) coating with wax, (ii) shea butter, (iii) keeping in pot-in-pot with KMnO_4 , and (iv) storage on open shelf in the laboratory (control). The treatments were assigned in a complete randomized design replicated three times. Coating with shea butter significantly ($p > 0.05$) delayed fruit ripening rate by 61% when compared with open shelf at the 8th day after storage (DAS), while there was no significant difference between ripening of fruits in pot-in-pot and those on open shelf. By 14 DAS fruit spoilage was 100% in pot-in-pot and open shelf while it was less than 50% for those coated with shea butter. The spoilage organisms isolated were *Colletotrichum* sp. and *Aspergillus niger*. Fruit analyses revealed that the titratable acidity, Brix, and pH of the fruits changed with duration of storage and treatment. Thus, shea butter coating is a good alternative to commercial wax to preserve the quality and the postharvest life of mango fruits.

Keywords: /'Saigon' mango fruit/ /shea butter/ /wax/ /ripening/ /spoilage/ /chemical quality/

ORANGE

Ayazpour, K., Rashanvar, M. and Zakerin, A. (2018). Control of *Penicillium* postharvest disease of Valencia sweet orange using rosemary extract and thiabendazol. *Acta Horti*, 1213: 615-618

DOI: 10.17660/ActaHortic.2018.1213.93

Abstract

In order to evaluate the effect of rosemary extract and thiabendazol fungicide on postharvest rot of Valencia sweet orange, an experiment was performed as factorial arrangement in a completely randomized design with four replications. The first factor was storage type including cool (4°C) and room temperature (25°C) storages and the second factor was treatment type including unwounded control, wounded control, wounded control inoculated with *Penicillium italicum* spores and treated with rosemary extract 150, 300 and 450 mg L⁻¹ and thiabendazol 1.0, 1.5 and 2.0 g L⁻¹. The fruits treated with extract and fungicide were inoculated with *Penicillium italicum* spores. The fruits were stored at room and cool temperature for two months and then the decay percentage, TSS, vitamin C and total acid content were measured. According to the results, the best treatment was thiabendazol 2.0, 1.5 and 1.0 g L⁻¹, respectively, in room temperature storage and rosemary extract could keep fruit quality compared with control.

Keywords: /Valencia/ /rosemary extract/ /*Penicillium italicum*/ /storage/

Huyen, N.T. and Tanachai, P. (2018). Effect of storage temperatures on postharvest qualities and storage life of 'Canh' sweet orange fruit. *Acta Horti*, 1213: 177-184

DOI: 10.17660/ActaHortic.2018.1213.23

Abstract

The effect of storage temperatures on postharvest qualities and storage life of Vietnamese sweet Canh orange fruit were studied, by storing fruit at ambient temperature, 3, 5, 7, and 9°C for 40 days. The percentage of fruit decay, weight loss, rate of respiration, sensory evaluations, total soluble solids content (TSS), total sugars, titrable acidity, and ascorbic acid were studied. The results showed that the percentage of fruit decay, weight loss, and rate of respiration were reduced during storage. After 40 days, the fruit stored in low temperatures still maintained their marketable properties as expressed by their TSS, total sugars, titrable acidity, ascorbic acid and the sensory evaluation by taste panels. For the control, stored at ambient temperature, the shelf-life was only 10 days.

Keywords: /'Canh' orange fruit/ /storage temperature/ /vitamin C/ /fruit decay/ /total sugars/ /titrable acidity/

Motamedi, E., Nasiri, J., Malidarreh, T. R., Kalantari, S., Naghavi, M. R., Safari, M. (2018). Performance of carnauba wax-nanoclay emulsion coatings on postharvest quality of 'Valencia' orange fruit. Scientia Horticulturae, 240: 170-178. DOI: 10.1016/j.scienta.2018.06.002

Abstract

For the first time, efficiency of the carnauba wax-nanoclay emulsions in preserving postharvest quality of 'Valencia' fruit was evaluated upon simulated storage and marketing. The different coatings containing nanoclay (i.e., 0.0, 0.5 and 1.0 w%) applied on orange and their performance were compared with uncoated fruit and two different commercial waxes. In general, the presence of nanoclay in the carnauba wax formulation greatly enhanced fruit sensory acceptability, nutritional quality and effectively prevented fruit weight loss during storage. Moreover, according to several statistical analyses such as cluster analysis, PCoA and Heat map-based surveys, the carnauba wax-nanoclay emulsions possessed similar behaviors with the maximum efficiency and placed accordingly in the same cluster, while the other four treatments were lonely occupied the next positions. Such nano-formulations could propose as a promising and cost-effective alternative avenue for commercial fruit waxes, towards sustainable postharvest management in retarding respiration rates and weight loss alongside preserving sensory and nutritional quality of fruits.

Keywords: /Nanoclay/ /Wax emulsion/ /Citrus/ /Postharvest quality/ /Off-flavor/ /Nutritional quality/

PEACH

Huan, C., An, X., Yu, M., Jiang, L., Ma, R., Tu, M., and Yu, Z. (2018). Effect of combined heat and 1-MCP treatment on the quality and antioxidant level of peach fruit during storage. Postharvest Biology and Technology, 145: 193-202. DOI: 10.1016/j.postharvbio.2018.07.013

Abstract

Peach fruit undergo a fast ripening and senescence after harvest, which results in fruit quality deterioration. In this study, a combined treatment with hot water and 1-MCP (HM) was applied to peach fruit to investigate its effect on the quality and antioxidant level during room temperature (RT) storage and low temperature (LT) storage. HM treatment is effective in slowing fruit softening, increasing total soluble solids (TSS) concentration and delaying fruit senescence during RT storage. However, HM treatment has no positive effect on delaying fruit senescence during LT storage, and even decreases fruit sweetness during the late stage of LT storage. Moreover, HM treatment can induce a short-term oxidative stress on the first day of both storages. However, during the late stage of RT storage, HM treatment reduces electrolyte leakage (EL) and suppresses reactive oxygen species (ROS) accumulation by enhancing the antioxidant ability at enzymatic and transcriptional levels in peach fruit. In contrast, HM treatment causes higher EL and ROS level and induces antioxidant activity only at the enzymatic level during the late stage of LT storage. In conclusion, HM treatment is more

effective at improving fruit quality and suppressing oxidative stress for fruit at RT, compared with fruit stored at LT.

Keywords: /Peach fruit/ /Treatment/ /Storage temperature/ /Antioxidant enzyme/ /Oxidative stress/

PEAR

Dong, Y., Wang, Y., and Einhorn, T. C. (2018). Postharvest physiology, storage quality and physiological disorders of 'Gem' pear (*Pyrus communis* L.) treated with 1-methylcyclopropene. *Scientia Horticulturae*, 240: 631-637. DOI: 10.1016/j.scienta.2018.06.073

Abstract

'Gem' is a crisp, juicy European pear (*Pyrus communis* L.) that can be consumed immediately at harvest or directly from cold storage. Alternatively, 'Gem' pears can ripen (5 d of 20 °C) to a soft, buttery, juicy texture once fruit accumulate 30 to 60 d of low temperature chill. In either condition, 'Gem' has a relatively short postharvest storage life of 5 months in regular air (RA). The purpose of this work was to evaluate two concentrations of 1-methylcyclopropene (1-MCP), 0.15 and 0.3 $\mu\text{L L}^{-1}$, to maintain crisp, juicy textural properties and extend the postharvest storage life of 'Gem'. Fruit were treated with 1-MCP, held in -1.1 °C RA and evaluated monthly (+1 d at 20 °C) for 7 months. Only minor differences were observed between 0.15 and 0.3 $\mu\text{L L}^{-1}$ 1-MCP for any of the response factors assessed. The respiration (R_s) and ethylene production rates of non-treated fruit increased ~2- and 30-fold, respectively, between 2 and 7 months. Fruit firmness (FF), peel chlorophyll content (IAD), and titratable acidity (TA) all decreased linearly over the 7-month storage period. Treatment with 1-MCP completely inhibited internal ethylene production for the first four months. Ethylene production increased linearly between 5 and 7 months to a maximum value ~15% of non-treated fruit. 1-MCP similarly suppressed R_s . FF, IAD, and TA were all significantly higher for 1-MCP-treated fruit than non-treated fruit. 1-MCP maintained the crisp and juicy textural properties of non-ripened fruit throughout the entire 7-month experiment by inhibiting ripening, despite a five-day 20 °C ripening treatment. In contrast, non-treated 'Gem' ripened after 2 months; however, the eating quality of non-treated fruit decreased after 5 months. Poor eating quality was associated with mealiness and insufficient softening after ripening. Internal browning and scald were first observed in non-treated fruit following five months of RA and reached levels of 26% and 85%, respectively, after seven months. The development of scald was closely associated with the accumulation of α -farnesene and conjugated trienols (CTols) in the fruit skin. 1-MCP significantly reduced the incidence of internal browning and completely inhibited the development of scald. Overall, 0.15 $\mu\text{L L}^{-1}$ 1-MCP maintained texture and fruit quality for 7 months RA and reduced the incidence of physiological disorders.

Keywords: /Ripening/ /Ethylene production/ /Fruit respiration/ /Crisp/ /Texture/ /Eating quality/

PEPPER FRUITS

Adewoyin, O.B. and Babatola, L.A. (2018). Shelf-life of pepper fruits as influenced by harvesting methods and storage conditions. Acta Hort. 1225, 211-216.

DOI: 10.17660/ActaHortic.2018.1225.28

Abstract

The effects of stage of ripeness at harvest, harvesting methods and storage conditions on storability of organic long Cayenne pepper fruits were investigated. Fruits were harvested with or without pedicels, at 10 or 100% ripe stage and stored at ambient conditions (21.9-33.5°C and 58-62% relative humidity (RH)), in refrigerator (4.0°C and 40-45% RH) or in evaporative coolant structure (10.0-15.8°C and 70-75% RH). Postharvest quality was assessed using percentage weight loss; and general appearance on a scale of 1-4. Means were separated by Duncan multiple range test (DMRT) at $p < 0.05$. Refrigerated fruits had significantly lower WL between 3 and 30 days in storage (DIS) compared to those in ambient conditions or evaporative coolant structure. Between 9 to 30 DIS, fruits harvested with pedicel intact exhibited significantly lower weight loss compared to those without pedicels. Furthermore, fruits harvested at 10% ripeness had significantly lower WL of than those harvested at 100% ripeness during the storage period.

Keywords: /Capsicum frutescence/ /storage/ /ripeness/ /harvesting methods/ /storability/

PERSIMMON

Imaizumu, T., Yamauchi, M., Sekiya, M., Shimonishi, Y., and Tanaka, F. (2018). Responses of phytonutrients and tissue condition in persimmon and cucumber to postharvest UV-C irradiation. Postharvest Biology and Technology, 145: 33-40.

DOI: 10.1016/j.postharvbio.2018.06.003

Abstract

Postharvest UV-C irradiation is expected to be a widely applicable sterilization technology for fruit and vegetables. In this study, the effects of UV-C irradiation on phytonutrients and tissue conditions in persimmon and cucumber were investigated. UV-C having a peak wavelength of 253.7 nm was irradiated on their surface (12.9 W m^{-2}) for 0 to 15 min. The UV-C irradiation was not effective for the enhancement of phytonutrients (polyphenol, β -carotene, ascorbic acid, chlorophyll) in persimmon and cucumber. However, some responses of tissue condition to UV-C irradiation appeared. Some persimmon fruit became blackened during storage, and the transfer of tannin from the parenchyma to the epidermal tissue was observed in the fruit. We also evaluated the factors responsible for the color change in the fruits. In addition, electrical impedance was measured, and electrical properties were obtained by equivalent circuit analysis. These properties reflected the tissue conditions. In particular, the extracellular resistance of UV-C-irradiated cucumber exhibited clear differences from non-irradiated samples.

Keywords: /Cucumber/ /Electrical impedance spectroscopy/ /Functional ingredient/ /UV-C irradiation/ /Persimmon/ /Storage/

POMEGRANATE

Fawole, O.A. and Opara, U.L. (2018). Value-addition of sunburned pomegranate fruit to reduce postharvest losses: a cosmeceutical perspective. Acta Hort. 1225, 221-226 DOI: 10.17660/ActaHortic.2018.1225.30

Abstract

Sunburn renders 15% of pomegranate fruit production unmarketable in fresh fruit and juice industries. Uses for these fruit are scarce and their disposal represents an environmental problem. This work presents a comparative study on the composition and bioactivities of oils extracted from pomegranate seeds of sunburned fruit (SBF) and healthy fruit (HF) for value-adding potential of fruit representing postharvest losses. Oil samples were extracted with petroleum ether by ultrasonication after drying using different drying techniques (freeze-, sun- and oven-drying). Compositional analysis included p-anisidine value, total phenolic content (TPC) as well as essential oils and sterols while the investigated bioactivities included DPPH radical scavenging ability (RSA) and tyrosinase enzyme inhibition ability. Results showed that oven-dried seeds, regardless of seed source (SBF or HF), yielded higher oil ranging from 20.20 to 24.35% of dry matter. However, regardless of drying method, oil obtained from SBF contained higher TPC (1.4-2.8 mg g⁻¹ of oil GAE) than those obtained from HF. A total of 17 compounds were identified by GC-MS analysis with the predominant being 9,12,15-Octadecatrienoic acid, a conjugated linolenic acid, constituting 70-72% of total essential oils. Gamma-tocopherol constituted 95% of total tocopherol while β -sitosterol constituted between 85-87% of total sterols. Overall, good RSA was exhibited by all the investigated oil samples with IC₅₀ ranging from 34.77 to 59.29 μ g mL⁻¹ AAE. RSA was influenced by seed source (p=0.006) and drying method (p=0.025). All the oil samples showed good ability to inhibit tyrosinase enzyme regardless of seeds source and drying method, with monophenolase and diphenolase IC₅₀ ranging between 0.31 and 0.49 mg mL⁻¹ and 0.64 and 2.43 mg mL⁻¹, respectively. This study indicates that seeds of sunburned pomegranate fruit can be exploited for high quality oil due to similar yield and bioactive composition compared to oil extracted from healthy fruit. In general, regardless of drying method, oils from seeds of SBF and HF both had good antioxidant activity and tyrosinase enzyme inhibition ability, which is applicable in skin care and nutraceutical industry.

Keywords: /fruit/ /bioactives/ /functional ingredients/ /functional foods/

POSTHARVEST LOSSES

Kitinoja, L., Tokala, V., & Brondy, A. (2018). A review of global postharvest loss assessments in plant-based food crops: recent findings and measurement gaps. Journal Of Postharvest Technology, 6(4).

Abstract

In the last decade, the topic of food loss and waste (FLW) has acquired global attention. The Food and Agriculture Organisation (FAO) and other national and international organisations

have estimated that about one-third of all the food produced and nearly half of all fruit and vegetables (F&V) are lost or wasted between harvest and consumption. Presently, abundant literature is available on the causes of postharvest losses and the technologies and practices required to manage them. However, measurements of postharvest losses of food crops are affected negatively by the use of differing definitions, scopes and ad-hoc data collection methods. Comparatively, very few studies are available on standardized measurement techniques of postharvest loss for plant-based food crops. The present review sheds light on different approaches utilized for postharvest food loss assessments and discusses existing and the opportunities available for improving food loss assessment methodologies, measurements and reporting. Detailed, standardized, high-quality information is required on both the types and amount of losses at specific value chain or food supply chain points, as is information on the causes and sources of those losses.

Keywords: /Postharvest losses/ /Food loss assessment/ /Measurement methodologies/ /Gaps/

Kitinoja, L., Tokala, V., & Brondy, A. (2018). Challenges and opportunities for improved postharvest loss measurements in plant-based food crops. *Journal Of Postharvest Technology*, 6(4).

Abstract

In the last decade, the topic of food loss and waste (FLW) has acquired global attention. The Food and Agriculture Organisation (FAO) and other national and international organisations have estimated that about one-third of all the food produced and nearly half of all fruit and vegetables (F&V) are lost or wasted between harvest and consumption. Presently, abundant literature is available on the causes of postharvest losses and the technologies and practices required to manage them. However, measurements of postharvest losses of food crops are affected negatively by the use of differing definitions, scopes and ad-hoc data collection methods. Comparatively, very few studies are available on standardized measurement techniques of postharvest loss for plant-based food crops. The present review sheds light on different approaches utilized for postharvest food loss assessments and discusses existing and the opportunities available for improving food loss assessment methodologies, measurements and reporting. Detailed, standardized, high-quality information is required on both the types and amount of losses at specific value chain or food supply chain points, as is information on the causes and sources of those losses.

Keywords: /Postharvest losses/ /Food loss assessment/ /Measurement methodologies/ /Gaps/

POSTHARVEST QUALITY

**Aliniaiefard, S. and van Meeteren, U. (2018). Greenhouse vapour pressure deficit and lighting conditions during growth can influence postharvest quality through the functioning of stomata. *Acta Hort.* 1227, 677-684.
DOI: 10.17660/ActaHortic.2018.1227.86**

Abstract

There is a tendency in horticulture to grow plants in greenhouses with high humidity and prolonged light periods, especially in winter. Although plants grow well in greenhouses with high relative humidity (RH) (low vapour pressure deficit; VPD), the plants produced under such greenhouse climates have limited control over water loss after harvest, leading to uncontrolled transpiration and decreased water content in the postharvest stage. This results in shortened vase-life of cut flowers and decreased quality of leafy vegetables. When plants had been produced in greenhouses with moderate humidity and natural day length, their stomata close when they are exposed to stomata closure-promoting environments (low RH, desiccation and darkness), as usually happens during the postharvest stage. However, in greenhouses with low VPD conditions and long photoperiods, stomata will not fully close during the postharvest stage; even decreased leaf water content will not result in full stomatal closure (stomatal malfunctioning) in products coming from those greenhouses. In this paper, greenhouse climate factors during the growth of plants that induce stomatal malfunctioning in the postharvest stage will be characterised. Approaches will be discussed to improve stomatal functionality under such greenhouse conditions in order to increase vase- and shelf-lives of products.

Keywords: /greenhouse/ /postharvest quality/ /relative humidity/ /stomata/ /VPD/

POTATO

**Deshi, K.E., Odiaka, N.I. and Obasi, M.O. (2018). Physiological ageing of potato seed tubers as affected by storage conditions and storage duration in Plateau State, Nigeria. Acta Hortic. 1225, 247-254
DOI: 10.17660/ActaHortic.2018.1225.34**

Abstract

A study was conducted at the National Root Crops Research Institute (NRCRI), Potato Programme Kuru, Jos Plateau State, Nigeria during the 2010-2011 and 2012-2013 to investigate physiological ageing of potato (*Solanum tuberosum* L.) seed tubers as affected by storage conditions and storage duration in Jos, Plateau state, Nigeria. Five potato cultivars (Nicola, Bertita, Diamant, BR63-18 and Roslin Ruaka) were stored for three durations (12, 24 and 32 weeks) in three kinds of store (room temperature store (RTS), diffused light store (DLS) and air conditioned store (ACS)). The experimental design was split-split plot in completely randomized design consisting of 5 potato cultivars, 3 storage conditions and 3 storage durations. Weekly temperatures and relative humidity were recorded in each type of store. The number of sprouts formed per tuber, sprout length and weight of whole tubers left after storage varied with cultivar. Storage of seed tubers in the DLS had the highest number of sprouts per tuber, while ACS had the lowest number of sprouts per tuber. Storage of seed tubers in the DLS produced the shortest sprouts. The ACS produced the heaviest whole tubers after storage while RTS and the DLS had similar tuber weight. Sprout length increased with time in storage in both seasons. The shortest sprouts occurred at 12 weeks of storage in both seasons. Tuber weight decreased with time in storage. There were significant interactions between cultivar × store type, cultivar × storage duration and storage duration × store type. Each cultivar had its critical

storage temperature conditions for optimal growth and yield after planting. The RTS, characterized by higher temperature which enhanced sprouting, would be suitable for a short period of storage (3 months), while the ACS would be suitable for prolonged storage (8-9 months). DLS reduced the storage temperature appreciably, increased sprout number and suppressed sprout growth thus it could be used for seed tuber storage to control physiological ageing of tubers. The design of the diffused light store needs to be further improved by using cost saving materials.

Keywords: /*Solanum tuberosum* L./ /storage duration/ /physiological age/

RAMBUTAN

**Srithanyarat, S. and Kwanhong, P. (2018). Effect of modified atmosphere packaging on the storage life of 'Rong-Rien' rambutan. Acta Horti, 1216: 99-104
DOI: 10.17660/ActaHortic.2018.1216.13**

Abstract

Rambutan (*Nephilium lappaceum* L.) has a short storage life because of rapid water loss and skin browning. Due to this problem it is difficult to export rambutan. The present study evaluated the effect of modified atmosphere packaging on the storage life of 'Rong-Rien' rambutan and was carried out at the Horticultural Postharvest Technology Laboratory at the Department of Agriculture. Fruits of 'Rong-Rien' rambutan were packed in 0.025-mm thick high density polyethylene (HDPE), low density polyethylene (LDPE), linear low density polyethylene (LLDPE), active packaging-1 (AP-1) or active packaging-2 (AP-2) bags. Control fruit was packed in plastic trays with no cover and all the treated and control fruits were stored at 13°C, 90-95% RH. It was found that LDPE, LLDPE or AP-1 bags could delay browning and prolong storage life of the fruit by 16 days. Gas composition inside the bag had 3.5% oxygen and 5.0% carbon dioxide at the end of storage. The fruit packed in HDPE, AP-2 bags and control had 12, 8 and 4 days storage life, respectively.

Keywords: /rambutan/ /storage life/ /browning/ /modified atmosphere packaging/ /polyethylene bag/

RICE

**Phan, Hieu Hien (2018). Mechanization and postharvest technologies in the rice sector of Vietnam. Acta Horti, 1213: 31-40
DOI: 10.17660/ActaHortic.2018.1213.4**

Abstract

Field mechanization patterns in the rice sector of Vietnam are different for the Mekong Delta (MRD) and other agricultural regions due to differences in field sizes. The MRD as the main rice-exporting area of Vietnam is more advanced with mechanized equipment; thus discussions are more focused as experience for other regions. Laser land leveling have been applied as an advanced technique for a sustainable agriculture. Postharvest technologies for rice in Vietnam

are described from harvesting, drying, storage, and milling. Specifically in the MRD, in the past 10 years harvesting by combines has increased at a very fast rate. Paddy drying is mostly done with the flat-bed dryer, with first units introduced in in early 1980s, and in 2014 takes care of about half of the harvested paddy in the MRD. The trend is toward central drying plants of 1000 t per day, using a combination of column dryers and fluidized-bed dryers. Rice milling machinery made by local manufacturers is probably of world-class; still, milled rice quality is low due to prior operations such as mixed cultivars and improper drying.

Keywords: /mechanization/ /postharvest technologies/ /laser land leveling/ /rice/ /Vietnam/

TOMATO

Liu, C., Zheng, H., Sheng, K., Liu, W., and Zheng, L. (2018). Effects of postharvest UV-C irradiation on phenolic acids, flavonoids, and key phenylpropanoid pathway genes in tomato fruit. *Scientia Horticulturae*, 241: 107-114. DOI: 10.1016/j.scienta.2018.06.075

Abstract

The possibility of increasing the content of phenolic acids and flavonoids, and inducing the key phenylpropanoid pathway genes in tomato fruit by postharvest UV-C irradiation was assessed. Mature-green tomato fruit were irradiated with UV-C at 4 kJ m⁻² and stored in the dark at 13 °C and 95% RH. UV-C irradiation was effective in increasing the total phenolics content and individual phenolic acids and flavonoids, including cafferic acid, p-coumaric acid, trans-ferulic acid, chlorogenic acid, gallic acid, protocatechuic acid, rutin and quercetin. UV-C treatment also induced expression of genes coding for key enzymes in the phenylpropanoid pathway, including PAL, C4H, 4CL, CHS, CHI, F3H and FLS, and enhanced the activities of PAL, C4H, 4CL, CHS and CHI during storage, which in agreement with a corresponding increase in phenolic compounds content. UV-C irradiation resulted in an increase of the content of phenolic acids and flavonoids in tomato fruit during storage.

Keywords: /UV-C irradiation/ /Tomato fruit/ /Phenolic compounds/ /Enzyme activity/ /Gene expression/

Le, Si Ngoc, Nguyen, Thi Phuong, Nguyen, Thi Thuy Lieu, Pham, Thi Ha Van and Ho, Xuan Nhu (2018). The effects of ethanol in the preservation of postharvest tomatoes. *Acta Hortic*, 1213: 229-236 DOI: 10.17660/ActaHortic.2018.1213.31

Abstract

The tomato cultivar Hongchau, which is grown in Ho Chi Minh City, was used for this study on the effects of ethanol in preserving postharvest tomatoes. Selected tomatoes presented with a surface area reaching 30-60% ripening, in a transition to pale pink or yellow colour. Exogenous

ethanol inhibits tomatoes from ripening through inhibition of the biosynthesis and activities of ethylene without reducing the tomatoes quality after ripening (Kelly and Saltveit, 1988). Treating tomatoes with ethanol concentration of 3.21 ± 0.3 (mL kg⁻¹) and temperature of 24 ± 1.3 °C for a duration of 4.12 ± 0.5 h, led to a storage period up to 28 days with a ripening rate of 81.98%, firmness of 3.31 kg cm⁻² and the lowest respiratory rate of 228.73 mL kg⁻¹ h⁻¹; and the tomatoes quality was still stable.

Keywords: /ethanol/ /tomatoes/ /shelf-life/ /ethylene production/

**Valida, A., Rivera, F.R., Salabao, A., Benitez, M., Sudaria, E., Acedo, A. and Ekman, J. (2018). Tomato (*Solanum lycopersicum*) quality grading at two storage temperatures. Acta Hortic, 1213: 269-274
DOI: 10.17660/ActaHortic.2018.1213.38**

Abstract

The study was conducted to evaluate the quality and shelflife of tomato (*Solanum lycopersicon* Diamante Max) at 7-10°C and 21-25°C and develop grading scale for research, education and industry use. Fruit quality at harvest was determined by maturity and absence of defects including deformation, blossom-end rot, and insect damage. During storage, quality changes were a result of the ripening process, with water loss and rotting as secondary factors. Storage at 7-10°C expectedly and more effectively delayed ripening, reduced weight loss, and prolonged shelf life of tomato fruits than at 21-25°C. Overall, the quality attributes were characterized using a scale for visual quality which was evaluated by a consumer panel. The results provide valuable information for establishing a system of grade standardization and classification along the production-marketing continuum.

Keywords: /quality standards/ /grade classification/ /temperature effects/

**Gonzaga, N.R., Gonzaga, A.B., Alcantara, C.G., Quirino, R.A. and Pescadero, I.R. (2018). Phenotypic and postharvest characterization of potential tomato (*Solanum lycopersicum* L.) lines for mid-elevation farmers of Northern Mindanao, Philippines. Acta Hortic, 1213: 533-536
DOI: 10.17660/ActaHortic.2018.1213.80**

Abstract

Tomato production is extensive in the highlands of Misamis Oriental in Northern Mindanao but the rampant occurrence of Tomato yellow leaf curl virus (TYLCV) which almost wipe-out its tomato industry calls the need for identification of promising tomato lines for small scale growers to sustain. The objective of this study was to evaluate the performance of four promising tomato lines acquired from AVRDC (AVTO 0101, AVTO 1004, AVTO 1007, and AVTO 1008) for yield, resistance to TYLCV, and fruit quality traits including its shelf life. Tomato lines AVTO 1004 and AVTO 1008 in terms of weight of fruits harvested per plant and TYLCV severity rating, respectively, are significantly better if not just comparable with the check cultivar at certain cropping periods. Fruits harvested from AVTO 0101 have more number of locules but the width of its pedicel scar is significantly bigger than all other entries. Consistently in both cropping

periods total soluble solids of AVTO 1007 and 0101 were significantly higher than the check cultivar. Longest shelf life was observed from AVTO 0101 though it also exhibited significantly higher weight loss upon termination but statistically comparable to the check cultivar. Results of this study explored potential and cheaper options for sources of planting materials for tomato growers in the area with performance and quality comparable to existing check cultivar.

Keywords: /TYLCV/ /Northern Mindanao/ /fruit quality/ /AVRDC/ /phenotypic/ /total soluble solids/

Najera C., Guil-Guerrero J.L., Enriquez L.J., Alvaro J.E., Urrestarazu M. (2018). LED-enhanced dietary and organoleptic qualities in postharvest tomato fruit. *Postharvest Biology and Technology*, 145: 151-156. DOI: 10.1016/j.postharvbio.2018.07.008

Abstract

Tomato fruit possess high lycopene concentrations, which increases after reaching the breaker stage of ripeness. Light emitting diode (LED) systems have emerged as a clean and efficient artificial lighting technique for use in horticulture. The objective of this research was to examine the effect of LEDs on postharvest and lycopene quality parameters. The effects on quality parameters were significantly different depending on the tomato fruit cultivar. The commercial and organoleptic quality parameters most affected were firmness and titratable acidity. The lycopene concentration in all tomato cultivars increased between 30% and 60% when they were exposed to LED light compared with dark-exposed fruit. One hour of LED light exposure per day during the postharvest phase of fruit increased commercial and organoleptic parameters, and increased the lycopene concentration. Fruit exposed to LED light with a high red:far red (R:FR) light ratio had increased firmness compared with those exposed to other types of white LED light. The highest R:FR ratio used in this study resulted in fruit with higher titratable acidity than those exposed to lower R:FR ratios. Overall, the results of this study demonstrated that the postharvest exposure of tomato fruit to LED light with a high R:FR ratio induces lycopene synthesis, with lycopene concentrations being 41% higher in comparison with exposure to darkness and 24% higher in comparison with exposure to other LED lighting conditions.

Keywords: /Cherry tomato/ /Redondo tomato/ /Light spectrum/ /Lycopene/ /Colour/ /Far red light/ /Solanum lycopersicum/

Song, J., Yoo, S. and Kim, D. (2018). The effect of 1-(3-phenyl-propyl)cyclopropene versus 1-MCP on the quality and storage life of tomato (*Solanum lycopersicum*) fruit. *Postharvest Biology and Technology*, 145: 20-26. DOI: 10.1016/j.postharvbio.2018.05.021

Abstract

1-Methylcyclopropene (1-MCP) is a cyclopropene compound that is widely used as an ethylene antagonist to extend the storage life of fresh fruit but has a difficulty in its use due to its chemically unstable and physically volatile properties. A cyclopropene compound with a long chain substituent instead of the 1-methyl in 1-MCP is expected to be non-volatile and easy to

formulate for applications in open working spaces due to its higher molecular weight and lipid-like chemical structure. Therefore, this study investigated the effect of 1-(3-phenyl-propyl) cyclopropene (PPCP) versus 1-MCP in the gaseous state on the quality and storage life of tomato fruit. The application of PPCP maintained a lower ethylene production and respiration rate of the tomatoes and delayed the color change and softening of the tomatoes up to 12 d when compared to the untreated controls. Thus, 16 $\mu\text{L L}^{-1}$ of PPCP reduced the fruit ethylene production and respiration rate by 42% and 25% of the untreated control, respectively, at 6 d after storage and showed equivalent effects on the delay in color change and softening of the tomato fruit to those of 1 $\mu\text{L L}^{-1}$ of 1-MCP. Therefore, our results suggest that PPCP can be used as an alternative ethylene antagonist for the postharvest storage of tomatoes and other climacteric fruit.

Keywords: /1-Methylcyclopropene/ /Ethylene antagonist/ /Long chain cyclopropene/
/1-(3-Phenyl-propyl)cyclopropene/ /Tomato/